

WHAT IS CLAIMED IS:

1. An optical information recording medium comprising:
first to Nth recording layers (where N is an integer equal to or larger
5 than 2) arranged sequentially from an opposite side of an incident side of a
laser beam, the laser beam that has entered from one side being irradiated
onto any one of the first to Nth recording layers, thereby recording and
reproducing information;
wherein at least any one of the first to Nth recording layers
10 comprises a correction information recording portion, the correction
information recording portion containing a correction information for
correcting a laser beam intensity based on a change in a transmittance of
the second to Nth recording layers between an unrecorded state and a
recorded state.
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2. The optical information recording medium according to claim 1,
wherein at least any one of the first to Nth recording layers comprises a
lead-in region exclusively for reproduction, and
the correction information recording portion is provided in the
20 lead-in region.
3. The optical information recording medium according to claim 1,
wherein the optical information recording medium has a disc shape,
the first to Nth recording layers comprise at least a test recording
25 region for performing a test recording and an information recording region
for recording user data, and
the test recording region of a Kth recording layer (where K is any
integer satisfying $1 \leq K \leq N - 1$) is arranged at a radial position different
from the test recording region and the information recording region of the
30 (K + 1)th to Nth recording layers.
4. The optical information recording medium according to claim 3,
wherein the first to Nth recording layers are provided with guide grooves for
tracking of the laser beam, and
35 in the (K + 1)th to Nth recording layers, guide grooves having
substantially the same shape as those of the information recording region
are provided at the radial position where the test recording region of the

Kth recording layer is arranged.

5. The optical information recording medium according to claim 1,
wherein the correction information is a correction coefficient determined by
5 a transmittance T1 in the unrecorded state and a transmittance T2 in the
recorded state in the second to Nth recording layers.

6. The optical information recording medium according to claim 1,
wherein the correction information is a correction coefficient, and
10 the correction coefficient is set so that a quality of a reproduced
signal of information recorded in a Kth recording layer (where K is any
integer satisfying $1 \leq K \leq N - 1$) using a corrected laser beam corrected with
the correction coefficient satisfies a predetermined criterion in the case
where at least any one of the (K + 1)th to Nth recording layers arranged
15 closer to the laser beam incident side with respect to the Kth recording layer
is in the unrecorded state.

7. The optical information recording medium according to claim 1,
wherein the correction information is a transmittance variation information
20 of each of the second to Nth recording layers, for indicating whether the
transmittance lowers or rises by recording the information.

8. The optical information recording medium according to claim 1,
wherein the correction information recording portion further contains a
25 target recording layer information for specifying a recording layer in which
user data are to be recorded using the laser beam corrected with the
correction information, in addition to the correction information.

9. The optical information recording medium according to claim 8,
30 wherein the correction information recording portion further contains a
recording layer specifying information for specifying any of the recording
layers arranged closer to the laser beam incident side with respect to the
target recording layer, in addition to the correction information and the
target recording layer information.

35 10. The optical information recording medium according to claim 1,
wherein the first to Nth recording layers comprise an information recording

region for recording user data, at least one of which comprises a recorded recording layer information recording portion containing a recorded recording layer information indicating the recording layer having the information recording region in which the user data already are recorded.

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11. The optical information recording medium according to claim 10, wherein the recorded recording layer information comprises a recorded address information for specifying a position of a recorded region.

10 12. An optical recording and reproducing method for recording information on and reproducing information from an optical information recording medium comprising first to Nth recording layers (where N is an integer equal to or larger than 2) arranged sequentially from an opposite side of an incident side of a laser beam, at least any one of which comprising
15 a correction information recording portion, the correction information recording portion containing a correction information for correcting a laser beam intensity based on a change in a transmittance of the second to Nth recording layers between an unrecorded state and a recorded state;

20 wherein when recording the information in and reproducing the information from a Kth recording layer (where K is any integer satisfying $1 \leq K \leq N - 1$), a pulse condition including a laser beam intensity is determined using the correction information.

25 13. The optical recording and reproducing method according to claim 12, wherein the optical information recording medium has a disc shape, the first to Nth recording layers comprise at least a test recording region for performing a test recording and an information recording region for recording user data, and the test recording region of the Kth recording layer is arranged at a radial position different from the test recording region and
30 the information recording region of the (K + 1)th to Nth recording layers, and

when recording the information in the Kth recording layer, the test recording is performed in the test recording region in the Kth recording layer, and a result of the test recording and the correction information are
35 used to determine the pulse condition including the laser beam intensity.

14. The optical recording and reproducing method according to claim 12,

wherein the correction information is a correction coefficient, and the correction coefficient is set so that a quality of a reproduced signal of the information recorded in the Kth recording layer using a corrected laser beam corrected with the correction coefficient satisfies a predetermined
5 criterion in the case where at least any one of the (K + 1)th to Nth recording layers arranged closer to the laser beam incident side with respect to the Kth recording layer is in the unrecorded state, and

when recording the information in the Kth recording layer, the pulse condition including the laser beam intensity is determined using the
10 correction coefficient.

15. The optical recording and reproducing method according to claim 14, wherein the quality of the reproduced signal is evaluated by measuring a jitter value of the reproduced signal.

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16. The optical recording and reproducing method according to claim 12, wherein the correction information is a transmittance variation information of each of the second to Nth recording layers, for indicating whether the transmittance lowers or rises by recording the information, and

20 when recording the information in the Kth recording layer, the laser beam intensity is changed according to the transmittance variation information.

17. The optical recording and reproducing method according to claim 12, wherein the optical information recording medium comprises the correction information recording portion further containing, in addition to the correction information, a target recording layer information for specifying a recording layer in which user data are to be recorded using the laser beam corrected with the correction information and a recording layer specifying
25 information for specifying any of the recording layers arranged closer to the laser beam incident side with respect to the target recording layer, the correction information comprising a plurality of correction coefficients, and a recorded recording layer information recording portion provided in at least one of information recording regions in the first to Nth recording layers
30 contains a recorded recording layer information indicating the recording layer having an information recording region in which the user data already are recorded, and

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when recording the information in the Kth recording layer, the target recording layer information corresponding to the Kth recording layer is read out, the correction coefficient recorded together with the recording layer specifying information corresponding to the recorded recording layer information among the recording layer specifying information recorded together with the read-out target recording layer information is selected from the plurality of correction coefficients, and the pulse condition including the laser beam intensity is determined using the selected correction coefficient.

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18. The optical recording and reproducing method according to claim 17, wherein whether the information already is recorded in each of the recording layers arranged on the laser beam incident side with respect to the target recording layer is judged by the recorded recording layer information, and the correction coefficient is selected according to the recorded recording layer.

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19. The optical recording and reproducing method according to claim 17, wherein the recorded recording layer information comprises a recorded address information for specifying a position of a recorded region, and the recorded address information further is used when selecting the correction coefficient.

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20. An optical recording and reproducing method for recording information on and reproducing information from an optical information recording medium comprising first to Nth recording layers (where N is an integer equal to or larger than 2) arranged sequentially from an opposite side of an incident side of a laser beam, by irradiating the laser beam from one side; the method comprising:

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30 setting in advance an order of the first to Nth recording layers in which user data are recorded;

recording a recorded recording layer information for specifying the recording layer in which the user data already are recorded at a predetermined position in the optical information recording medium;

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reading out the recorded recording layer information before recording new user data; and

recording the new user data in the recording layers in the order

later than the recording layer corresponding to the recorded recording layer information according to the preset order.

21. The optical recording and reproducing method according to claim 20,
5 wherein the recorded recording layer information comprises a recorded address information for specifying a position of a recorded region.

22. An optical recording and reproducing apparatus for recording
10 information on and reproducing information from an optical information recording medium comprising first to Nth recording layers (where N is an integer equal to or larger than 2) arranged sequentially from an opposite side of an incident side of a laser beam, at least any one of which comprising a correction information recording portion, the correction information recording portion containing a correction information for correcting a laser
15 beam intensity based on a change in a transmittance of the second to Nth recording layers between an unrecorded state and a recorded state;

wherein the optical recording and reproducing apparatus comprises
a correction information storing portion for storing the correction information recorded in the optical information recording medium,
20 a control portion for determining a pulse condition for recording user data using the correction information stored in the correction information storing portion, and

a pulse condition setting portion for controlling the laser beam using the pulse condition determined in the control portion.

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23. The optical recording and reproducing apparatus according to claim 22, wherein the optical information recording medium has a disc shape, the first to Nth recording layers comprise at least a test recording region for performing a test recording and an information recording region for
30 recording user data, and the test recording region of a Kth recording layer (where K is any integer satisfying $1 \leq K \leq N - 1$) is arranged at a radial position different from the test recording region and the information recording region of the (K + 1)th to Nth recording layers, and

the optical recording and reproducing apparatus further comprises a
35 signal quality judging portion for judging a quality of a reproduced signal of the test-recorded information, and the control portion determines a pulse condition for recording the user data using the correction information and a

result of the test recording.

24. The optical recording and reproducing apparatus according to claim 22, wherein the optical information recording medium comprises the correction information recording portion further containing, in addition to the correction information, a target recording layer information for specifying a recording layer in which user data are to be recorded using the laser beam corrected with the correction information and a recording layer specifying information for specifying any of the recording layers arranged closer to the laser beam incident side with respect to the target recording layer, and a recorded recording layer information recording portion provided in at least one of information recording regions in the first to Nth recording layers contains a recorded recording layer information indicating the recording layer having an information recording region in which the user data already are recorded, and

the optical recording and reproducing apparatus further comprises a recorded recording layer information storing portion for storing the recorded recording layer information recorded in the optical information recording medium, and the control portion determines the pulse condition for recording the user data using the correction information and the recorded recording layer information.

25. The optical recording and reproducing apparatus according to claim 24, wherein the correction information comprises a plurality of correction coefficients, and

when recording the information in a Kth recording layer (where K is any integer satisfying $1 \leq K \leq N - 1$), the control portion reads out the target recording layer information corresponding to the Kth recording layer, selects from the plurality of correction coefficients the correction coefficient recorded together with the recording layer specifying information corresponding to the recorded recording layer information among the recording layer specifying information recorded together with the read out target recording layer information and determines the pulse condition for recording the user data using the selected correction coefficient.

26. The optical recording and reproducing apparatus according to claim 25, wherein the control portion judges by the recorded recording layer

information whether the information already is recorded in each of the recording layers arranged on the laser beam incident side with respect to the target recording layer and selects the correction coefficient according to the recorded recording layer.

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27. The optical recording and reproducing apparatus according to claim 25, wherein the recorded recording layer information comprises a recorded address information for specifying a position of a recorded region, and the control portion further uses the recorded address information when selecting the correction coefficient.

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28. The optical recording and reproducing apparatus according to claim 23, wherein the signal quality judging portion evaluates the quality of the reproduced signal by measuring a jitter value of the reproduced signal.

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29. The optical recording and reproducing apparatus according to claim 22, wherein the pulse condition includes a laser beam intensity, a pulse duration and a generation timing and is set according to at least any one of a length or a space of recorded marks.

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